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## **Airbag Module and Assembly of Steering Wheel and Airbag Module**

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### Technical Field

The invention relates to an airbag module with a gas generator support and also to an assembly of a steering wheel and an airbag module including such gas generator support.

### Background of the Invention

5        Generally, several spring elements are provided for making available a readjusting force for an airbag module which is held so as to be movable in the direction of the central axis of a steering wheel. In addition, guide elements are necessary, which permit a movement of the airbag module in axial direction, but not in radial direction. Finally, additional elements are also required to produce  
10        the horn contact. The large number of individual parts increases both the installation effort and also the installation costs.

### Brief Summary of the Invention

      The invention provides an airbag module which is displaceable in the direction of the central axis of a steering wheel, the installation of the airbag module in the  
15        steering wheel requiring fewer parts and a reduced installation effort.

      According to the invention, an airbag module comprising a gas generator support is distinguished in that arranged on the gas generator support is a plate spring which comprises a continuous ring-shaped inner section and several arms. The arms each have a first end connected to the inner section and a second, free  
20        end which is bent away axially with respect to a central axis of the plate spring. The arms are elastically deformable under axial pressure. The plate spring, which is easy to install, provides the necessary readjusting force alone, after the entire airbag module has been pressed down to actuate the horn.

According to a preferred embodiment of the invention, the plate spring is a stamped and bent part of sheet metal, in which the first ends of the arms are formed on at the outer periphery of the inner section. Such a plate spring can be produced in the desired form at a favorable cost. Preferably, the inner section is fastened to the gas generator support and the arms are bent away from the gas generator support, so that before installation of the airbag module according to the invention, the plate spring can already be pre-mounted thereon.

A further development of the invention makes provision that at least one contact is provided on the gas generator support, opposing at least one arm of the plate spring, which contact comes into contact with the arm through a movement of the gas generator support in the direction of the central axis of the plate spring against the resistance of the plate spring, and thus closes a circuit to trigger a horn signal. Therefore, the plate spring can also be used for establishing the horn contact and makes the installation of corresponding cooperating contacts superfluous. The airbag module according to the invention with a gas generator support made from plastic, in which the contact is embedded in the gas generator support by injection molding, proves to be particularly favorably priced and easy to install.

The invention also provides an assembly of a steering wheel and of an airbag module, the airbag module comprising a gas generator support. A plate spring is arranged between the gas generator support and the steering wheel. The plate spring comprises a continuous ring-shaped inner section and several arms which each have a first end formed on the inner section and a second, free end which is bent away in the direction of the central axis of the plate spring. The arms are elastically deformable under axial pressure. In such an assembly, the plate spring is not fastened to the gas generator support, but rather to the steering wheel, before the airbag module is then placed onto the plate spring.

In order to use the plate spring in the assembly according to the invention for triggering the horn, the arms of the plate spring, with the exception of a zone for

establishing the horn contact, are electrically insulated with respect to the steering wheel, in particular by being embedded in an injection-molded plastic sheathing.

According to a further development of the invention, a counter-form corresponding to the plate spring is formed in the steering wheel, which permits a guidance in the direction of the central axis of the steering wheel. Fastening or guiding devices which would otherwise be necessary can therefore be dispensed with. The counter-form can be constructed as a slit or alternatively as an elevation.

As an alternative to fastening the plate spring to the gas generator support, in the assembly according to the invention the inner section can also be fastened to the steering wheel and the arms can be bent away from the steering wheel in the direction of the gas generator support.

#### Brief Description of the Drawings

-Figure 1a shows a top view of a ring-shaped plate spring;

-Figure 1b shows a sectional view of the plate spring of Figure 1a along the line A-A;

-Figure 2 shows a sectional view of a steering wheel with an airbag module according to the invention; and

-Figures 3a and 3b each show a perspective view of a steering wheel with a receiving means for the plate spring.

#### Detailed Description of the Preferred Embodiment

In Figures 1a and 1b a ring-shaped plate spring 10 is illustrated which, as is further described below, is installed between the gas generator support of an airbag module and a steering wheel. The plate spring 10 has a continuous ring-shaped inner section 12. Outside the inner section 12, four identical arms 14 in the shape of a partial ring are formed, which in accordance with the illustration of Figure 1a extend tangentially along the outer periphery of the inner section 12 and

each are connected at a first end 14a with the outer periphery of the inner section 12. In accordance with the illustration in Figure 1b, the free, second ends 14b of the arms 14 are bent away axially downwards with respect to the central axis 16 of the plate spring 10. The plate spring 10 is made of sheet metal and is constructed  
 5 as a stamped and bent part with preferably three or four arms 14, but fewer or more arms 14 can also be provided. The plate spring 10 is designed such that, when it rests on the bent arms 14, the arms 14 deform elastically with a downwardly-directed pressure onto the inner section 12, and provide an upwardly-directed readjusting force.

10 Figure 2 shows an airbag module 18 with a covering 20, a gas bag 22, a gas generator 24 and a gas generator support 26. The airbag module 18, more precisely its gas generator support 26, is held on a steering wheel 30 by means of a conventional fastening device 28, the fastening device 28 permitting a movement of the airbag module 18 in the direction of the central axis 32 of the  
 15 steering wheel 30. Between the gas generator support 26 and steering wheel 30, a ring-shaped plate spring 10 is provided concentrically to the central axis 32 of the steering wheel 30, as was described with aid of Figures 1a and 1b, in which, however, the arms 14 are also bent away radially outwards. In addition, the arms 14, as can be seen from Figure 2, are bent such that they do not rest with the free  
 20 ends 14b, but rather with the bearing sections 14c on an opposite surface of the steering wheel 30, the inner section 12 of the plate spring 10 resting on the underside of the gas generator support 26 and being firmly connected therewith. On the other hand, no firm connection is provided between the arms 14 and the steering wheel 30. It is also possible to install the plate spring 10 rotated through  
 25 180°, so that the inner section 12 is fastened to the steering wheel 30.

The plate spring 10 provides for the necessary restoring force, when after down of the airbag module 18 to trigger a horn signal the airbag module 18 is to be pushed back again into its initial position shown in Figure 2.

30 In the embodiment with a plastic gas generator support 26, shown in Figure 2, the horn contact for triggering the horn signal is produced by means of the plate

spring 10 itself. Metal contacts 34 are injection-molded on the gas generator support 26 opposing the free end 14b of an arm 14 of the plate spring 10. The arm 14 is bent such that, on lowering of the airbag module 18 by pressure onto the covering 20, the contacts 34 strike onto the free end 14b of the arm 14 and thus  
5 close a circuit which brings about the triggering of the horn signal. With the exception of the zone which comes in contact with the contacts 34, the arms 14 are electrically insulated with respect to the steering wheel 30, for example by being embedded in an injection-molded plastic sheathing.

In Figures 3a and 3b it is indicated that a receiving means for the plate spring  
10 10 is provided in the steering wheel 30. This receiving means can be formed, for example, by elevated zones 36 (Figure 3a) or by depressions 38 (Figure 3b) and permits a guidance of the plate spring 10 and hence of the entire airbag module 18 in the direction of the central axis 32 of the steering wheel 30. A movement in radial direction in relation to the central axis 32 is precluded by the form fit on the  
15 arms 14 of the plate spring 10. A locking of the plate spring 10 in the guide does not take place, because the arms 14 only have a low height in relation to their radial width.